REMARKS

Claims 54-74 are currently pending in the subject application, and are presently under consideration. Claims 56 and 65 have been amended to correct typographical errors, such that no further searching would be necessitated by this amendment. Favorable reconsideration of the application is requested in view of the amendments and comments herein.

I. Claim Objections

Claims 53, 65 and 56 have been objected because of alleged informalities. Claims 56 and 65 have been amended to correct typographical errors. Applicant submits that claim 53 has been previously cancelled, such that the objection is moot. If the Examiner meant to refer to claim 54 (instead of claim 53), Applicant submits that the use of "first type of tones" and "the second type of tones," as set forth in claim 54, line 8, are correct such that no correction is required. Accordingly, Applicant respectfully requests that the claim objections be withdrawn.

II. Rejection of Claims 54, 56, 57, 59, 60, 62, 63, 65, 67,68, and 70-74 under 35 U.S.C. 103(a)

Claims 54, 56, 57, 59, 60, 62, 63, 65, 67, 68, and 70-74 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,795,409 to Youssefmir ("Youssefmir"). Applicant traverses these rejections for the following reasons.

The Office Action dated September 15, 2006 (hereinafter the "Office Action") contends that claim 54 is obvious over Youssefmir. However, upon analyzing the contents of Youssefmir in detail, Applicant fails to see the relevance of this reference to the subject matter that is recited in claim 54. The unrelatedness of Youssefmir becomes evident upon consideration of what Youssefmir teaches in comparison to what is recited in claim 54. It further appears that the Office Action mischaracterizes the subject matter of Youssefmir in order to support its obviousness rejection.

Specifically, the Office Action relies on Youssefmir, at column 7, line 50, to column 8, line 12, to support a contention that a combiner 229 performs channel estimation to compensate for multipath." However, a thorough reading of Youssefmir reveals that the combiner 229 is provided for combining one or more beams from a respective beamformer 225. Youssefmir at

column 7, lines 43 to 52, column 7, lines 62 through column 8, line 4. Simply stated, the combiner 229 taught by Youssefmir does not perform a channel estimation that is employed as part of computing beamforming, as recited in claim 54.

The Office Action while discussing Youssefmir as receiving "a signal that comprises data tones (second type) and training tones (first type)," fails to allege that noise is estimated on a received channel for each of a plurality of first type of tones to provide corresponding noise estimates for each f the plurality of first types, as recited in claim 54. Perhaps, the objection of claim 54 demonstrates a failure to appreciate what is recited in claim 54. Instead, the Office Action simply alleges that the system estimates interference, which the Office Action refers to as noise, and that it uses the estimates to allow the beamformer to mitigate interference via the smart antenna processing strategy disclosed in Youssefmir. See Office Action, at page 3. However, the cited sections of Youssefmir, column 8, lines 1 – 12 and column 27, lines 1 – 11, refer to unrelated discussions and teachings of Youssefmir, such that there is no basis to conclude that any noise estimates would be used by the beamformer as suggested in the Office Action.

Significantly, the cited section of Youssefmir, at column 8, lines 1 – 12, fails to suggest that noise estimates are performed on training tones (the first type of tones), as contended in the Office Action at Page 3, lines 5-9. In fact, the cited section of Youssefmir, at column 8, lines 1 – 12, refers generally to operation of the beam combiner 229 and the beamformer 225, which operate in a manner consistent with traditional prior art approaches disclosed in Youssefmir. For example, in the Background of Youssefmir, at column 1, lines 40 – 52, Youssefmir teaches that prior art smart antenna system include a beamformer that form several fixed beams and a mechanism (*e.g.*, a combiner) for combining one or more beams. Applicant submits that this prior art discussion of beamforming from the Background of Youssefmir is simply repeated and described with respect to Fig. 2B in Youssefmir at columns 7 and 8.

Moreover the Office Action appears to analogize the determination of the smart antenna weighing parameters with the computing beamforming recited in claim 54. Applicant submits that there is no basis in Youssefmir to conclude that the beamforming, which is limited to the description of Fig. 2b of Youssefmir, would include the determination of the smart antenna weighting parameters. In sharp contrast, Youssefmir specifically teaches both a determination of

downlink weighting parameter and a determination uplink weighting parameter as part of the smart antenna processing strategy. The weighting parameters are not disclosed as being determined or utilized with respect to the beamforming taught by Youssefmir. Instead, with respect to Fig. 2b, Youssefmir describes that the combiner 229 operates by weighing selected beams from the beamformer according to a set of uplink weighting parameters. Youssefmir, at column 7, lines 54 – 56. Youssefmir further teaches that on the downlink, the combiner 229 processes a signal to determine weighted versions to transmit one or more selected beams of the beamformer 225. Youssefmir, at column 8, lines 5 – 8.

Moreover, Youssefmir teaches that the weighting parameters are determined to optimize a criterion based on the error, such as is formed by a known signal or a constructed reference signal. See Youssefmir, column 6, lines 9 – 22. That is, in contrast to the characterization in the Office Action, the error signal is formed from the known signal or from the constructed reference signal. However, according to Youssefmir, the error signal and the weighting parameters are not employed by the beamformer 225. Instead, as discussed above with respect to the combiner 229, the combiner - not the beamformer - employs weighting parameters to combine the respective signals from the beamformer (e.g., beamforming has already been performed prior to the combiner applying the weighting parameters to the respective fixed signals from the beamformer). The difference between claim 54 and Youssefmir appears to be due largely to the widely different purpose of Youssefmir, which is to coordinate or synchronize transmission of multiple base stations and multiple receivers. See Youssefmir, Abstract.

Significantly, the Office Action admits that Youssefmir does not specify that estimates based off a particular training tone applied to the closest data tone. The Office Action then concludes, without the benefit of any prior art teaching, its obviousness analysis, however, failing to allege that the estimates being described relate to computing beamforming in the manner recited in claim 54. Instead, the Office Action simply improperly concludes that, "it would have obvious to one of ordinary skill in the art at the time of this application that the estimates made at a particular instant in time or a particular frequency or a particular tone should be applied to the closest data tones (in time or frequency) for the purpose that the training tone noise estimate (and hence the noise mitigation) would be most accurate for the nearest data tone estimates." See Office Action at page 3 and 4.

It is well settled, that an examiner cannot base a rejection on the assertion that it would have been obvious for a person to do something not suggested in the art because it would give the advantages stated in Applicant's specification. *Panduit Corp. v. Dennison Manufacturing Co.*, 1 U.S.P.Q.2d 1593 (Fed. Cir. 1987). As discussed in the specification, by utilizing the combined noise estimation for a first type of tones that is used for computing beam forming on a second type of tones, the number of computations can be significantly reduced, thereby improving system performance. See, *e.g.*, the subject application, at page 5, lines 6-8; page 9, lines 2-4. There is nothing in Youssefmir that suggests the approach to noise estimation and beamforming that is recited in claim 54, where noise estimates are performed on a first type of tones and beamforming is computed for a second type of tones based on the noise estimate of at least one of the plurality of the first type of tones that is nearest the at least one tone of the plurality of the second type of tones in the received signal. As a result of the failure to teach or suggest the approach recited in claim 54, the approach described in Youssefmir consequently also fails to achieve the benefits of the approach recited in claim 54.

Again, Youssefmir fails to suggest that the error signal and interference, as characterized in the Office Action, would pertain to the computing of beamforming recited in claim 54. Therefore, even it were obvious to one of ordinary skill in the art to do what the Examiner is alleging in the Office Action, claim 54 still would not be obvious since claim 54 recites computing beamforming for at least one tone of the plurality of the second type of tones based on the channel estimation and based on the noise estimate of at least one of the plurality of first type of tones that is nearest the at least one of the tone of the plurality of second type of tones. That is, nothing in Youssefmir teaches or suggests that beamforming be performed based on noise estimated performed for a different type of tones other than the respective data tones. As discussed above, Youssefmir contains little discussion on the details of the beamforming performed by the system of Fig. 2B such that claim 54 would not be obvious to one of ordinary skill in the art.

For some reason, the Office Action contends that column 29, lines 1 – 10 of Youssefmir teaches that interference and multipath estimates may be determined from training tones in a time division or frequency division system. However, such a contention is contrary to anything set forth in Youssefmir at the cited sections. Specifically, column 29, lines 1 – 10 simply states

that "the invention is not limited to any one of type of architecture or error interface, and thus, may be utilized in conjunction with one or a combination of TDMA, FDMA or CDMA, or TDD or FDD, or other architectures/protocols." The remaining section at column 29, prior to the claims, appears to be boilerplate language that is unrelated to the proposition in the Office Action. Applicant submits there is not support in Youssefmir for the contention that multipath estimates may be determined from training tones in a timed division or frequency division system as suggested in the Office Action.

The Office Action further employs what appears to be speculation and/or improper hindsight by stating that since the error signal is used to mitigate the effects of interference and multipath, the error signal comprises a noise (interference) estimate and channel (multipath) estimate. Office action, at page 3.

For these reasons, applicant submits that claim 54 is patentable. Applicant therefore respectfully requests reconsideration and allowance of claim 54 as well as claims 55 through 59 depending therefrom.

Regarding claim 57, the Office Action contends that the received tones inherently require indexing and extracting steps for the purpose of being able to retrieve separate and process individual tones (both training and data). However, the Office Action fails to mention any teaching or suggestion in Youssefmir that might lend credence or support for the rejection of claim 57 with respect to the beamforming. In particular, claim 57 recites that beamforming is computed for the given index second type of tone based at least in part on corresponding noise estimates of the selected first type of index tone that is nearest the given index second type of tone in the receive signal. Since Youssefmir fails to teach or suggest any use of computing beamforming in the manner recited in claim 57, there is no motivation to further modify the teachings of Youssefmir - apart from the present application - to employ the indexing in conjunction with such beamforming as recited in claim 57.

The Office Action contends that the system of Youssefmir inherently comprises a training tone indexing and extraction. See Office Action at page 4, fourth full paragraph. However, it is well settled that an element of a claim is not inherent in disclosure of prior art unless extrinsic evidence clearly shows that missing descriptive matter is necessarily present in the thing described in the reference. *In re Robertson*, 49 USPQ2d 1949 (Fed. Cir. 1999). There

simply is nothing disclosed in Youssefmir that would provide for the interrelationship of the indexing of first and second types of tones and selecting the first type of indexed tones (as recited in claim 57), to enable the beamforming to be computed as recited in claim 57. Accordingly, claims 57 and 63 are patentable.

Assuming *arguendo* that Youssefmir would inherently require some indexing and extraction of tones from the received signal, there is no suggestion or motivation in Youssefmir for estimating noise for each of the first type of tones extracted from the received signal, such that the beamforming of claim 54 (or claim 60) can be performed for a second type of tones based on such noise estimations. Accordingly, claims 57 and 63 patentable. There similarly is no basis to conclude that the extracting and noise estimation of claims 59 and 68 would be inherent in the approach taught by Youssefmir. Accordingly, claims 59 and 68 are also patentable.

The Office Action contends that claim 60 is rejected for the same reasons as provided for the rejection of claim 1. Applicant presumes that the Office Action meant for claim 54 in place of "claim 1." Regardless, claim 60 is patentable over Youssefmir for the same reasons as discussed above with respect to claim 54.

Claim 65 has been amended to correct the typographical error suggested in the Office Action, such that this amendment does not necessitate further searching. The Office Action contends that claim 65 is rejected for the same reasons as the rejection for "claim 1" (again, presumably meaning to refer to claim 54). However, in contrast to claim 54 and the rejection, claim 65 further recites a tone extractor configured to extract a plurality of first type of tones from a signal received over a communications channel. Since the rejection of claim 54 fail to identify any tone extractor in the teaching of Youssefmir, the Office Action fails to establish a prima facie case of unpatentability of claim 65.

Even assuming *arguendo* that the rationale applied with respect to claims 57, 59, 63 and 68 were further applied to the rejection of claim 65, the teaching of Youssefmir, as a whole, still fails to teach or suggest the communication receiver recited in claim 65. Similar to as discussed with respect to claim 64, there is no teaching or suggestion in Youssefmir that a beamformer would be configured to compute beamforming for a second type of tones in a received signal based on channel estimates and noise estimates of the extracted plurality of first type of tones

that is nearest to respective ones of the second type of tones in the received signal as recited in claim 65. Instead, Youssefmir simply glosses over the approach utilized for its beamforming with respect to the description of Fig. 2B. Accordingly, there is no basis in the art to conclude that claim 65 is obvious as suggested in the Office Action. Applicant notes that the Court of Appeals for Federal Circuit has cautioned that knowledge of one ordinary skill in the art does not act as a bridge over gaps in the substance presentation of an obviousness case, but instead is intended to supply an important guarantee of objectivity in the process. *Okajima v. Bourdeau*, 261 F.3d 1350, 59 USPQ2d 1795 (Fed. Cir. 2001).

For these reasons, applicant respectfully requests reconsideration and allowance for claim 65.

Regarding claim 63, the Office Action contends that claim 63 is rejected for the same reasons as claim 54. However, in contrast to the rejection of claims 54, claim 63 further recites means for selecting the at least one of the plurality of the first type of index tones that is nearest the given index of the second type of tone and the signal. Thus, even assuming *arguendo* that there would be some indexing mechanism for indexing through the tones and the received signal, there is no basis to conclude from the teachings of Youssefmir that any basis or reason for selecting one of the tones that is nearest the given index second type of tone in the signal, as recited in claim 53. As a consequence of failing to suggest such a selection of an indexed tone, there is further no teaching or suggestion in Youssefmir for computing beamforming based at least in part on the noise estimation of the selected first type of index tones that is nearest the given index second type of tone in the signal. Instead, applicant submits that one of ordinary skill in the art would presume that beamforming occurs for each tone based on noise estimates for each respective tone, as is consistent with the description of Youssefmir. Accordingly, Applicant respectfully requests reconsideration and allowance of claim 63.

Similarly, claim 68 recites that the communication receiver of claim 66 further comprises a noise selection function operative to select one of the plurality of the first type of tones nearest the index of second type of tone that is employed by the beamforming computation. The Office Action fails to allege or contend any teaching in Youssefmir to relate to the selection of the plurality of tones performed by the noise selection function recited in claim 68, such that no prima facie obviousness case has been presented in the Office Action regarding claim 68.

Instead, similar to claim 57 and 59, the Office Action relies on the same rationale that was utilized to reject claim 54. The rational applied to claim 54, however, is defective with respect to claim 68 since claim 68 recites the noise selection function. For these reasons and for the reasons stated above with respect to claim 65, Applicant respectfully requests reconsideration and allowance of claim 68.

The Office Action states that claim 73 is rejected for the same reasons as the reasons as applied to "claim 1" (again, presumably meaning to refer to claim 54). Claim 73 is patentable for at least the reasons stated above with respect to claim 54. Moreover the Office Action contends that the system taught by Youssefmir would inherently include the preprocessing system for the purpose of converting the received analog waveform in digital format to be processed. Applicant submits that the failure to explicitly describe such systems for preprocessing the electronic signals and for providing the tones of a first type and tones of a second type, as recited in claim 73, actually weighs on the side of non-obviousness of claim 73. For example, why would Youssefmir employ noise estimates for one type of tone to perform beamforming computations on a different second type of tone in the received signal when there is no mention or suggestion in Youssefmir of utilizing such different types of tones in such a manner? Pondering this questions in view of these reasons as well as those discussed above with respect to claim 54, reveals that claim 73 is patentable.

III. Rejection of Claims 55, 58, 61 64, 66 and 69 under 35 U.S.C. 103(a)

Claims 54, 56, 57, 59, 60, 62, 63, 65, 67, 68, and 70-74 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Youssefmir in view of U.S. Patent No. 6,006,110 to Raleigh ("Raleigh"). Applicant traverses these rejections for the following reasons.

The Office Action admits that Youssefmir does not teach the noise estimation process recited in claim 55. The addition of Raleigh fails to make up for the deficiencies of Youssefmir as discussed above with respect to claim 54.

Regarding claim 55, the Office Action relies on Raleigh for a purported teaching of noise estimation. The Office Action states that, "Raleigh discloses a beamforming system where interference (noise) is estimated in order to optimize beamforming." Citing Raleigh, at Col. 8, lines 10 – 45. The Office Action further contends that the estimation of received interference

plus noise signal sequence of the equalization strategy (disclosed at Col. 15, lines 25-39, of Raleigh) corresponds to the noise estimation process recited in claim 55.

In sharp contrast to the contention in the Office Action, the various embodiments disclosed in Raleigh at Col 8, lines 25-45, Col. 156 lines 25-39, as well as Raleigh more generally - alone or in combination with Youssefmir - fail to teach or suggest the particular channel estimation, noise estimation and beamforming recited in claim 55, which depends from claim 54. Instead, as described in the Supplement 1 section of Raleigh, Raleigh discloses that the noise estimate is computed for each data subcarrier; namely, based on the received signal, the channel estimate and an estimate of the transmitted data at each data subcarrier. See Raleigh at Col. 15, line 61, through Col. 17, line 28. This is in sharp contrast to the noise estimation recited in claim 55, which is performed on each of the plurality of the first type of tones, and in which the beamforming is computed for at least one of the plurality of the second type of tones (claim 54). Moreover, the Office Action appears to mischaracterize Raleigh by alleging that a noise estimator computes the difference between the received training signal and the previous training signal. See Office Action at Page 5. In fact, the only mention of any training signals in Raleigh occurs specifically at: Col. 3, line 19; Col. 4, line 65; Col. 7, line 44; and Col. 9, line 25. None of these sections in Raleigh that mention training signals, however, supports the allegations in the Office Action relating to claim 55.

Specifically, claim 55 recites two independent indications that are computed: namely; (1) a first indication of a difference between a first one of a first type of tones in one burst relative to the first one of the first type of tones in a proceeding burst; and (2) a second indication of variance and correlation of the first indication. In further contrast to what is taught by Raleigh, claim 55 averages the second indication over time to provide an average indication of noise that defines the noise estimate for at least one of the plurality of the first type of tones (See claim 54). It is based on such noise estimation and channel estimates that the beamforming (of claim 54) is computed for the second type of tones. Since Raleigh fails to teach or suggest noise estimation, as recited in claim 55, (Raleigh instead teaching estimating noise based on the received signal, the channel estimate and an estimate of the transmitted data at each subcarrier), the purported combination of Raleigh and Youssefmir consequently also fails to teach or suggest claim 55. See Raleigh at Col. 15, line 61, through Col. 17, line 28.

For the reasons stated above, allowance of claim 55, which depends from claim 54, is respectfully requested. Claims 61 and 66 are patentable for at least the same reasons discussed herein in support of claim 55.

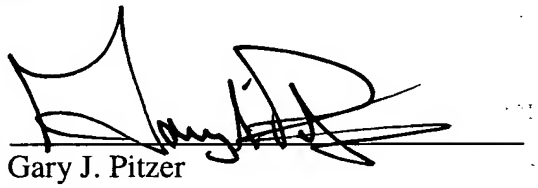
CONCLUSION

In view of the foregoing remarks, Applicant respectfully submits that the present application is in condition for allowance. Applicant respectfully requests that the application be passed to issue, including claims 54-74.

Should the Examiner have any questions concerning this paper, the Examiner is invited and encouraged to contact Applicant's undersigned attorney at (216) 621-2234, Ext. 106.

No additional fees should be due for this response. In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to Deposit Account No. 20-0668.

Respectfully submitted,

By: 

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